

What is claimed is:

1. A method for manufacturing a group III nitride compound semiconductor, which hardly grows epitaxially on a substrate by crystal growth, comprising:

forming a buffer layer on said substrate into an island pattern such as a dot pattern, a striped pattern, or a grid pattern such that substrate-exposed portions are formed in a scattered manner; and

forming a group III nitride compound semiconductor layer on said island patterned buffer layer by growing said group III nitride compound epitaxially in longitudinal and lateral directions; wherein a width of said substrate-exposed portions fall within the range of 1 to 10 multiplied by a width of said island patterned buffer layer.

2. A method for manufacturing a group III nitride compound semiconductor according to claim 1, further comprising:

combining epitaxial growth of said group III nitride compound formed on said island patterned buffer layer in a longitudinal direction and epitaxial growth of said group III nitride compound in a lateral direction by using the difference between the velocities of epitaxial growth of said group III nitride compound semiconductor layer on said buffer layer and on said substrate, in order to obtain a group III nitride compound semiconductor layer which covers the surface of said substrate.

3. A method for manufacturing a group III nitride compound semiconductor according to claim 1, wherein said substrate is made of sapphire.

4. A method for manufacturing a group III nitride compound semiconductor according to claim 1, wherein said buffer layer is made of aluminum nitride (AlN).

5. A method for manufacturing a group III nitride compound semiconductor according to claim 1, wherein said group III nitride compound semiconductor growing in a lateral direction does not comprise aluminum (Al).

6. A method for manufacturing a group III nitride compound semiconductor according to claim 1, further comprising:

forming an another group III nitride compound semiconductor layer on said group III nitride compound semiconductor in order to obtain a light-emitting group III nitride compound semiconductor device, wherein said group III nitride compound semiconductor is formed on a region where said island patterned buffer layer is not formed.

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Ref:
Application No.: 10/723,046
Applicant: Hui Peng
Art Unit: 2811
Application Title: Texture on Substrate and a Method for Localizing and Minimizing Effects of Lattice Mismatch
Filing date: 11/26/2003

Dear Examiner Shouxiang Hu

This letter responses to your Office Action Summary dated Aug. 12, 2004 and sent to me on Aug. 16, 2004, related to my patent application above.

In the Office Action Summary, you have said

" This application contains claims 1-23 directed to the following patentably distinct species of the claimed invention:

- Species 1, embodiment of FIGs. 3a-5
- Species 2, embodiment of FIGs. 6a-6c
- Species 3, embodiment of FIGs. 7
- Species 4, embodiment of FIGs. 8
- Species 5, embodiment of FIGs. 9
- Species 6, embodiment of FIGs. 10.

"Applicant is required under 35 U.S.C 121 to elect a single disclosed species for prosecution on the merits to which the claims shall be restricted if no claim is finally held to be allowable."

35U.S.C 121 states that "If two or more independent and distinct inventions are claimed in one application, the Director may require the application to be restricted to one of the inventions."

According to your instruction and 35U.S.C 121, I withdraw embodiment of FIGs. 6a-6c, embodiment of FIG 9, and embodiment of FIG. 10.

Accordingly, I also withdraw two original independent claims 9 and 17 and original dependent claims 10-16 and 18-23. Only keep one independent claim that is claim 1.

Now my patent application discloses only one invention defined by independent claim 1. I have illustrated several FIGs to further explain the possible embodiments of the invention. A possible embodiment is to repeatedly use the technique of texturing a surface on different surfaces, for example, texturing the surface of a substrate, then texturing the surface of an epitaxial layer again.

FIGs. 3a-5 show that a semiconductor device of the present invention comprises a texture formed on a substrate, and then grow either a buffer layer or an epitaxial layer on the textured substrate. Claims 1-8 are corresponding to FIGs 3a-5.

Embodiments of FIGs. 7 and 8 show a repeated structure of FIGs. 3a-5, i.e., the semiconductor device of the present invention further comprises a second texture formed on the

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top of the epitaxial layer, and then growing either a second buffer layer or a second epitaxial layer on the second texture. Dependent claim 9-11 are added and corresponding to FIGs. 7 and 8.

A repeated structure may be claimed as an embodiment of an invention. For example, US patent # 6,645,295 (a copy of the claim section is attached for your convenience) shows that:

Independent claim 1 of US patent # 6,645,295 states: "A method for manufacturing a group III nitride compound semiconductor,, comprising:forming a group III nitride compound semiconductor layer on said island patterned buffer layer by"

Then dependent claim 6 of US patent # 6,645,295 states: "A method for manufacturing a group III nitride compound semiconductor according to claim 1, further comprising: forming an another group III nitride compound semiconductor layer on said group III nitride compound semiconductor layer on said ...", which is exactly repeating the structure of claim 1.

For comparison: Independent claim 1 of my patent application states: "A semiconductor device, comprising a substrate with texture on one of its two surfaces, and an epitaxial layer grown on the top of said texture."

Added dependent claim 9 of my patent application states: "The semiconductor device of claim 1, further comprises a second texture formed on the top of said epitaxial layer."

Added dependent claim 10 of my patent application states: "The semiconductor device of claim 1, further comprises a second epitaxial layer grown on the top of said second texture."

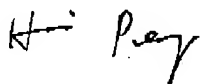
Added claims 9-11 show a repeated structure of claim 1 and are corresponding to FIGs. 7 and 8.

Therefore, FIGs. 3a-5, 7, and 8 of my patent application really show only one invention with embodiments. Those embodiments are just repeating the same structure as that of claim 1.

According to your instruction and 35 U.S.C. 121, I only keep one independent claim (that is claim 1) and dependent claims 2-8, and add dependent claims 9-11 (please see attachment below), so that my patent application only claims one invention and meets the requirement of 35 USC 121.

Best Regards

Hui Peng



Sep. 2, 2004

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Claims:

What I claim are:

1. A semiconductor device, comprising
a substrate with texture on one of its two surfaces, and
an epitaxial layer comprising an active layer and grown on the top of said texture.
2. The semiconductor device of claim 1, further comprising buffer layer grown in between said epitaxial layer and said texture.
3. The semiconductor device of claim 1, wherein said texture comprising wells and walls.
4. The semiconductor device of claim 3, wherein the width of said walls is in a range of nanometers to micrometers.
5. The semiconductor device of claim 3, wherein the depth of said well is in a range of nanometers to micrometers.
6. The semiconductor device of claim 3, wherein said wells have the shape of said semiconductor device.
7. The semiconductor device of claim 6, wherein the dimension of said wells is in the range of nanometers to micrometers.
8. The semiconductor device of claim 1, wherein said substrate emits light.
9. The semiconductor device of claim 1, further comprises a second texture formed on the top of said epitaxial layer.
10. The semiconductor device of claim 9, further comprises a second epitaxial layer grown on the top of said second texture and comprising a second active layer.
11. The semiconductor device of claim 10, further comprising a second buffer layer grown in between said second epitaxial layer and said second texture.